

UNIT IV: DRIVING ENVIRONMENT

This unit covers handling the complex natural environments in which driving occurs. Instruction is approached from an accident prevention point of view. Contents include adjusting driving practices to compensate for limited traction, limited visibility, and difficulties imposed by night driving. These topics are not addressed as emergencies. Rather, they are addressed as potential emergencies. The unit focuses on how to handle these situations to lessen the probability that they will lead to a true emergency.

INSTRUCTIONAL OBJECTIVES

Knowledge Objectives

Students will know:

Reduced Traction

1. The major environmental factors that reduce traction
2. Speed reduction is the principal way to handle reduced traction situations
3. Procedures for handling common reduced traction situations

Reduced Visibility

1. The major environmental factors that limit visibility
2. The procedures for improving visibility when driving
3. Techniques to compensate for common conditions limiting visibility

Night Driving

1. Safety precautions to take in preparing for night driving
2. The need to adjust driving practices during night time driving
3. Ways of modifying their seeing techniques to improve ability to see at night
4. How they should modify driving practices to compensate for visual limitations posed by night time driving

Belief objective

Students will accept that they seriously increase risk for themselves and others if they fail to adjust their driving to conditions.

Content may be covered entirely through presentation. Group discussions and problem-solving should concentrate mostly on night-driving situations, as these are the most frequently encountered environmental problems. The single greatest night time hazard—over-driving headlights—can be emphasized through visuals and problem-solving.

The "Bad Weather Driving" section of the Iowa Driving Manual is an appropriate home-study assignment.

REDUCED TRACTION

Traction is the affinity that binds tires to the road surface. It is what holds the car to the road and allows drivers to pick up speed, slow down, stop and change direction.

- Traction is reduced whenever there is any foreign substance (e.g., liquids, leaves, gravel) on the road surface. These substances interfere with the bond between the tire and the road. The more (deeper) the foreign substance present, the more traction is reduced.
- The only way to improve traction is to reduce speeds. Lower speeds reduce a vehicle's lateral force and give the tires more time to plow through the surface debris, locate the road surface and bond with the road.
- Tire treads are designed to gather water and other debris and channel them away from the road surface. This serves like a windshield wiper, clearing away debris to provide for an adequate bonding.
- Snow disrupts traction more than water because it is denser. This makes the tire work harder to fight through and achieve traction with the road. Ice is especially dangerous as it forms a complete barrier between the tire and the road. Like glass, ice has virtually no bonding qualities.

Anticipating Reduced Traction

To cope with reduced traction conditions, drivers must know where and when these conditions are most likely to occur and how to compensate for these conditions.

- Areas shaded by large, permanent objects, such as buildings, trees, or overpasses, can provide less traction than the rest of the road. This is because rain or snow tends to linger in these areas longer. In cold weather, these locations tend to freeze first and thaw last because of the cooler temperature provided by the shade.
- Bridges and overpasses also are very dangerous. They tend to be the first sections of the road to freeze because they receive no "retained" heat from the ground below. Elevated, curved ramps are particularly dangerous because the front tires will need to have good traction to force the car to make the curve.
- Road surfaces are often slippery on hot days, just after a rain has begun to fall--especially if it hasn't rained for a while.

--For the first 10-15 minutes, the rain combines with oil from asphalt and cars as well as with dirt, dust and rubber on the pavement, to create a very slick mixture.

--Busy intersections are especially hazardous because this is where vehicles tend to stop for longer periods of time (waiting for light changes or gaps in traffic), leaving more "gunk" on the roads.

- Wet roads are most dangerous when the temperature is hovering near the freezing point. At temperatures of 30-34 degrees, water and ice combine to form the slipperiest mixture of all.

Adjusting For Reduced Traction

To handle reduced traction situations safely, drivers must use the best (most traction-bearing) path available, lower their speeds, increase the normal space cushion, and minimize changes in speed and direction.

Find The Best Path

If faced with a low traction area such as a body of standing water or an icy patch, drivers should try to go around this area, if at all possible. If drivers cannot skirt the hazard, they should try to pick the best path through the hazard.

- On wet roads, drivers should try to place their tires in the tracks left by the tires of vehicles ahead. The tires of the preceding vehicles will have already swept away some of the water from these paths, leaving the driver's own tires with less water to plow through.

- In snowy conditions, drivers will be better off steering into loose snow, out of hard packed snow grooves.

Reduce Speed

The single best way to improve traction is to reduce speed. Reducing speed gives the tires more time to sweep away whatever substance is causing the loss of traction.

Drivers should try to match their speeds to the degree of traction afforded. General rules of thumb:

- On wet roadways, cut speed by 15% (about 5 mph in city travel, about 10 mph on highways)
- On snow covered roads -- cut speed by half
- On icy roads, slow to a crawl.

As icy roads provide virtually no traction, the best speed is 0. Drivers shouldn't drive on ice unless absolutely necessary.

Increase Space

It will take vehicles longer to stop in reduced traction conditions. Therefore, drivers must increase the normal following distance to avoid rear ending others.

Space Ahead

Drivers should increase the 2-second following distance to a 3-second distance on rainy roads and a 4-second distance on snowy roads.

Space When Stopped

Drivers should also maintain extra space between their cars and the vehicle ahead when stopped.

- Instead of stopping one car length behind the vehicle, they should wait two lengths behind. In the event that the driver's rear ended, this will prevent the driver's vehicle from being pushed into the vehicle ahead.
- It is especially important to leave this much space behind a vehicle ahead when that vehicle is stopped on an upgrade. On snowy roads, the force of gravity may send the vehicle downhill, into the driver behind.

Space to the Sides

Drivers must also be extra protective of their space cushions to the sides.

- On slippery surfaces, vehicles in adjacent lanes may skid, sending the rear of their vehicles into the driver's lane.
- Not only should they avoid driving next to vehicles, they should drop well back of vehicles in adjacent lanes to give the other driver plenty of time (space) in which to recover from a potential skid.
- To open up space to the sides, drivers should always slow down--never speed up--in reduced traction situations.

Minimize Changes In Speed/Direction

Maintaining speed and direction is especially important when traction is low. Every time a driver turns, accelerates or brakes, the bond between tire and road is momentarily weakened. This increases the chance of the wheel spinning and the car sliding out.

Speed Changes

All changes in speed must be made gently.

- Drivers must accelerate slowly and brake lightly.
- Waiting for and maintaining extra large space cushions will give drivers the room needed to stop more slowly and will give the tires more time to build traction.
- To slow on slippery surfaces, drivers should first reduce speed by easing up on the accelerator. Brakes may be applied later.
- Brakes should never be jammed on, as this will increase stopping distance. When brakes are jammed on in low traction conditions, there's a greater chance of brake lockup. Non-turning wheels cannot sweep the road surface as well as turning wheels.
- After first decelerating by easing up on the gas, drivers may begin to brake lightly, gradually and steadily increasing pressure to come to a full stop.

Direction Changes

Drivers must also try to minimize changes in direction. Any change in direction (e.g., switching lanes, taking curves, turning) increases the demand for traction from the front tires. Wet or snowy roads may not be able to provide enough traction to accommodate the maneuver.

- The more severe the desired change in direction, the greater the demand on front-tire traction. To accommodate the demand, drivers should change direction as slowly and as gradually as possible.
- Drivers must remember that each time they change direction, they increase their chances of losing traction and sliding out. The more changes in direction they make, the more chances of sliding they take.

Hydroplaning

If drivers drive much too fast on slippery roads, they can end up water skiing on four wheels. This phenomenon is called "hydroplaning."

- It occurs when the tires are moving so fast or the rain is so heavy that the rubber cannot make any contact with the road.
- In this situation, the tires are actually riding on a film of water.

Causes of Hydroplaning

Excess speed causes hydroplaning.

- Most tires can wipe water from the road at speeds of up to 35 mph.
- The higher above 35 mph the car goes, the less complete a job the tires can do of wiping the road.
- In a very heavy rain, tires can be completely overwhelmed by the water, losing all contact with the road at 50 mph.
- Hydroplaning can occur well below 50 mph on vehicles equipped with bald or nearly bald tires. It is, after all, the grooves in the tires that channel the water off the road.

Hydroplaning and Traction

When a car is hydroplaning, the tires provide no traction. This leaves the driver with absolutely no control over the car.

- Drivers cannot change direction or stop when hydroplaning. If the car was not completely straight when the hydroplaning began, it can go into a severe skid.
- A gust of wind will be sufficient to knock a hydroplaning car into a skid.
- What makes hydroplaning so dangerous is that drivers don't realize they are hydroplaning until they try to turn or stop and find the car will not respond.

Avoiding Hydroplaning

Drivers can reduce the chances of finding themselves in a hydroplaning situation by taking care of their tires.

- Tires should be properly inflated with adequate tread available. (The shallower the tread, the less water the tire can channel away.) Drivers can check tire tread with a Lincoln penny. Stick the penny into the tread "head first." If the tread does not at least touch the top of Abe's head, the tire should be replaced.
- Once the driver's on a wet road, the only way to prevent hydroplaning is to be sure to drive at a moderate speed. This gives the tires a fighting chance to achieve traction.
- Drivers should also open up extra following distance if they are behind a large truck. The truck tires are set further apart than a car's and channel extra water into the tracks that the car's tires will follow.

Signs of Hydroplaning

Sometimes tires will warn a driver that hydroplaning is imminent.

- If the tires make a sloshing sound, this is a cue that the tires are riding more on the water and less on the road.
- Drivers cannot count on their tires to give them this warning, however. It is not an easily identifiable sound and few drivers can interpret it correctly even if they hear it.
- The failure of the vehicle ahead to leave a true track is hydroplaning. Drivers following at the same speed may also be hydroplaning.

Stopping Hydroplaning

Drivers who find themselves in a hydroplaning situation, must ease off the accelerator until traction returns.

- Drivers must not brake until traction has been restored. Using the brake can throw the car into a skid.
- Drivers should also avoid turning the steering wheel. If they cause the car to change direction, even slightly, they could start a skid.

REDUCED VISIBILITY

Environmental factors such as frost, ice, rain, fog, temperature differences and sun glare can reduce visibility.

Maintaining Visibility

The first rule for improving visibility in these conditions is to keep the windows as clear and clean as possible. Drivers should scrape frost and ice from all windows before driving.

Defrosters

They should use the defroster to help loosen ice on the front windshield.

- This will also allow them to free the wipers more easily, reducing the chances of damaging the wiper blade with the scraper. Damaged blades do not clear the windshield completely, leaving streaks which reduce visibility.
- Drivers should also know to keep the defroster on in very cold weather. This will keep condensation from forming on the inside of the windshield, and if it's storming out, keep ice from reforming on the windshield.

Windshield Wipers

Whenever it is raining or snowing, drivers should use their windshield wipers.

- The driver should set the wiper speed to match the intensity of precipitation.
- They should also use the windshield washer (if available) to keep the windshield clean of debris (dirt, oil, salt, etc.) kicked up by other vehicles on the road.

Condensation

If condensation forms on the interior of the windows, drivers must wipe it off.

- They should not use their hands, as the grease may leave streaks. Rather, they should use a clean cloth or tissue. Drivers must be sure to keep this cloth in arms reach, so they will not have to take their eyes off the road to "hunt" for it while driving.
- To prevent condensation build up, drivers should try to minimize moisture inside the vehicle.
- Using the defroster is the best way to do this, although this will often not prevent condensation from forming on the side and rear windows.
- To prevent the build up of condensation on these surfaces, drivers may need to open the vents.

Compensating For Reduced Visibility

Since drivers can't control external factors such as rain, fog, or glare, they must compensate by adjusting their driving practices. In general, drivers must adopt the same practices required in reduced traction situations:

- Reduce speed
- Increase space cushion.
- Use headlights
- Signal speed changes
- Use lane delineators

Reduce Speed

The major reason to drive more slowly in reduced visibility situations is that drivers will need more time to search for and identify potential hazards accurately.

- Drivers must be sure to select a speed that allows them to stop within the distance at which they can see objects clearly.
- Driving slowly gives them the extra time needed.

Increase Following Distance

Low visibility conditions require greater following distances because drivers cannot see ahead as far as they normally could.

- Drivers may be able to see only the vehicle ahead rather than what is happening with traffic further down the road.
- Since they can react only to the actions of the car immediately ahead, they must leave themselves more space in which to make the appropriate response.

Increase Space to the Sides

Drivers need to maintain extra space to the sides:

- When drivers have difficulty seeing, their natural tendency is to concentrate on the road ahead.
- In that situation, drivers will often forget to check their blind spot before changing lanes. Drivers do not want to find themselves trapped in such driver's blind spots.
- Additionally, the blind spot may be bigger than usual, if the other driver has failed to clear frost or snow from the side and rear windows or the side mirror.

Increase Headlights

When driving in fog, snow, or very heavy rain, drivers will need to use their headlights to see and be seen.

- In these conditions, low beams are more effective than high beams.
- The light from high beams will bounce off of fog or sheeting rain and back into the driver's eyes. This creates a self-imposed glare which reduces their ability to see.
- The high beams might blind drivers ahead (either oncoming cars or those traveling in the same lane), causing them to lose sight of the road and crash.

Signal Speed Changes

Drivers should also make a point to signal changes in speed.

- This is especially important when reduced visibility is combined with reduced traction, as others in the road will need the extra time to adjust to the change smoothly.
- The flashing lights (either turn signals or tap brake lights) are especially valuable in low visibility conditions because they are more eye catching than a hand signal or a solid brake light.

Lane Delineators

Drivers should use lane markings in reduced visibility conditions.

- These can be a valuable reference point in very heavy fog to help drivers keep the car within the lane.
- Checking the lane markings will force the driver to stop staring ahead, helping the driver resume a normal searching pattern.

Stopping

In a very heavy downpour or dense fog, it may be impossible to see well enough to drive at any speed. If this happens, drivers should pull off the road and wait until visibility improves.

Handling Glare

When driving into low sunlight, it can be very hard to see obstacles that may be on the road. In addition to reducing speed and increasing the space cushion, drivers should take action to reduce the amount of glare assaulting their eyes. These actions include:

- Adjusting sun visor so that shadow comes just below the eyes (a lower shadow line means that the visor has been dropped down too far, needlessly restricting the driver's field of vision). Visors can be swung over to cut down on glare from the side, as well.
- Wearing polarized sunglasses. Polarized lenses will eliminate glare, while unpolarized lenses dim the intensity of the glare only slightly.
- Looking away from the sun. Drivers should try to avoid looking directly at the sun by lowering their eyes or looking to the side. Squinting can also improve matters. However, drivers must be aware that all of these actions restrict their field of vision and should be accompanied by an even greater reduction in speed.

NIGHT DRIVING

Darkness presents drivers with the same visibility problems associated with fog and heavy rain. The major difference is that nighttime is predictable. Since everyone knows when night will come, drivers have no excuses for being unprepared to drive safely at night.

Problems of Night Driving

Like other reduced visibility conditions, nighttime driving increases the demands placed on eyes. Drivers must force them to work harder to see. Specific visual capabilities taxed at night include:

- Night vision -- the ability to see in low levels of light. The ability to see well at night varies from driver to driver. But no one, not even a cat, can see as well at night as during the day.
- Glare resistance -- the ability of the eye to continue seeing when "overdosed" with light. In darkness, the eye's pupils widen to allow more light to enter the eyes. When widened pupils suddenly receive a burst of light (from headlights or other sources) the pupils cannot contract fast enough, allowing drivers to see only light rather than objects.
- Glare recovery -- the ability to regain normal vision in prevailing light, once the glare is over. Essentially, this is the reaction time of the pupil--how quickly the eyes can "digest the overdose of light" and start to widen pupil again.

The greatest cause of nighttime crashes, is not driver's being blinded by others headlights. The greatest reason for nighttime crashes is drivers overdriving their own headlights--i.e., driving so fast that they are unable to stop within distance at which they can see objects clearly.

Preparing To Drive At Night

Drivers can reduce the risks of nighttime driving before starting the car by taking steps to assure that their eyes will be able to receive as much light as is available.

- Avoid using tinted eye glasses. Tinted lenses reduce the amount of light available to the eyes. At nighttime this only makes a bad situation worse. Sunglasses should be avoided at all costs. Lenses with "adjustable tint" should be avoided if possible. Even when "clear," adjustable lenses have a residual tint.

- Clean and check headlights. Dirty lenses on headlights can reduce the amount of light they will throw on the road by as much as 90%. Headlights should be cleaned weekly; more frequently, if driver has been operating on dirty, muddy, salty or wet roads. Driver should also make sure that all headlights are working. It is illegal and unsafe to drive at night with only one headlight working. One headlight does not provide enough light to allow the driver to see clearly within the distance needed to stop at even low (city driving) speeds.
- Make sure both high and low beams are working. Low beams allow drivers to see clearly only about 100 feet ahead. Drivers will be overdriving low beams at speeds of 30 mph or more, absent other sources of light. High beams allow drivers to see only about 250 feet ahead. Unless other light sources are available, drivers will be overdriving their high beams at speeds in excess of 50 mph. [Visual 19 (Overdriving Head Lights) may be used here.]
- Verify that the high-beam indicator light works. The light reminds drivers when they are using high beams.
- Set the rearview mirror at "night" setting. This setting reflects headlights from vehicles behind away from the driver's eye. The effect is like putting sunglasses on the mirror.
- Adjust instrument panel lights. Instrument panel should be at the dimmest setting at which the driver can still read the instruments. Lights from the instrument panel do not help the driver see what's going on in or near the road. However, instrument panel lights can bounce off the windshield, creating interior glare. Also, light inside the vehicle will cause the pupils to restrict. Drivers want to keep their pupils dilated, to see far out into the night.
- Clean windows. Dirty windows not only reduce the amount of light that can get through the windshield, they diffuse (spread) glare from oncoming headlights, making a normal glare situation even worse.
- Don't smoke. Smoking leaves a film on the windshield, inhibiting vision and diffusing glare. Additionally, carbon monoxide in the smoke impair night vision and slows glare-recovery time.

Night Driving Techniques

As in other reduced visibility situations, night driving requires drivers to reduce their speed and maintain a larger cushion of space around their vehicles. Additionally, drivers must know how to use their headlights properly and how to deal with headlight glare.

Headlight Use

By law drivers must use their headlights from sunset to sunrise or whenever visibility is 500 feet or less.

- Since high beams allow drivers to see clearly further down the road, they should use high beams whenever it is safe to do so.
- It is unsafe, and illegal, to use high beams when an oncoming vehicle is within 500 feet of the driver, or the driver is within 200 feet of a car ahead
- Failure to switch to low beams in these conditions may "blind" oncoming drivers or drivers immediately ahead. If these drivers are blinded, they may lose track of their lane and have an accident.
- Switch to low beams whenever overtaking another vehicle. High beams could blind a driver when reflected off the side mirrors.

- Switch to low when approaching the crest of a hill. Assume that an oncoming driver is just beyond the crest.
- Refrain from using high beams on city streets. When not going more than 30 miles an hour, drivers don't really need the extra light. Additionally, light is usually available from other sources (street lights, neon signs, etc.). While high beams won't help a driver see better on city streets, they may blind others, including those waiting to cross at intersections.

Handling Glare From Oncoming Vehicles

If blinded by high beams from an oncoming vehicle, driver should:

- Flash headlights off and on, very quickly, a couple of times. Often, drivers who have forgotten they are on high beams will respond quickly by dimming their lights. Drivers should not switch on their high beams to get the other driver's attention. This may blind the other driver, doubling the risk (two blinded drivers rather than one).
- Reduce speed. Their eyes will need time to recover from glare. While the eyes are recovering, the driver will want to cover as little ground as necessary.
- Look away from lights. Squint and focus eyes along the right side of the lane. Drivers can use lane markings, the curb, or the shoulder edge as a reference point to help keep in lane.

Handling Glare From Vehicle Behind

If blinded by the lights from a car behind (via the rear view mirror), the driver should:

- Respond by flicking headlights off and on quickly. This will encourage drivers to either switch to low beams or drop further back. Even if the driver behind does not take the hint, it will alert him or her to the fact that the flashing driver intends to do something.
- If the glare situation persists, the "something" that should be done is to slow down, encouraging the driver to pass and get the source of the glare out of the way.
- Until the driver behind has completely passed, the blinded driver should avoid staring at the rearview mirror. As the driver is passing, avoid staring in the side mirror.

Space Cushion

In addition to driving slower, drivers should maintain larger space cushions at night.

- Little more than the lights of other vehicles are visible. Darkness hides the surroundings, depriving drivers of the reference points their eyes need to judge speeds accurately. Without these reference points, the eyes require more time to determine how quickly vehicles are stopping or approaching.
- Maintaining a 3-second following distance will give the eyes time to determine how quickly vehicles are stopping. Drivers should also wait for extra wide gaps in traffic before attempting to cross or merge.
- Passing should be kept to a minimum--especially on 2 lane roads. Not only is it extremely difficult to tell how fast oncoming traffic is approaching, but the driver runs the risk of blinding the driver of the car being passed, via the side view mirror. Passing on high speed roads is not a good idea either.
- Drivers should remember that if they have to go above 50 mph to pass another driver, they are overdriving their own headlights (high beams).

Others' Tail Lights

One way to partially offset the loss of visual input from objects clothed in darkness is to make the most of what is quite visible at night driving--the tail lights of other vehicles.

- Drivers can use the tail lights to help judge their closing rate. As a driver gets closer to tail lights, they will appear to get larger and further apart.
- By tracking the tail lights of others, drivers can also get an early warning of problems, as yet unseen, on the road ahead. If the tail lights (vehicle) ahead make a sudden lane change, it may indicate something is blocking the lane ahead.
- If the tail lights start bobbing up and down, the driver can prepare for a rough road--potholes or debris.